

EXAM DETAILS

- Wednesday, June 16th
- Multiple Choice and Free Response
- Bring a pencil and a calculator
- You will be provided with a periodic table and formulas/conversion factors

EXAM TOPICS:

- Weather: Unit 3, Lessons 1-14 (pp. 253-321)
- Toxins: Unit 4, Lessons 1-12 (pp. 347-399)

HOW TO STUDY

- Review all vocabulary at the end of each textbook section
- Review notes
- Review quizzes and tests
- Review Section Summaries in textbook

WEATHER

Unit 3, Section I

- 1) What is "weather" and what causes it?
- clouds, winds, temperature, precipitation in a region at given time
- caused by interaction of Earth, atmosphere, water, Sun.
- 2) Describe 3 pieces of information found on a weather map.

Varies - Pressure, temp, precipitation, clouds, jet stream, fronts

- 3) What is a physical change?

Change in matter that does NOT change the chemical makeup

- 4) Do rain gauges report height of precipitation or volume? Why?

Height: consistent regardless of container shape or size

- 5) Convert 85 in to cm.

$$85 \text{ in} \times \frac{2.54 \text{ cm}}{1 \text{ in}} = \boxed{21.59 \text{ cm}} \quad \text{OR} \quad \frac{1 \text{ in}}{2.54 \text{ cm}} = \frac{85 \text{ in}}{x}$$

- 6) What does it mean if two variables have a proportional relationship? What is proportionality constant?

Related by proportionality constant; related directly to each other (if 1 doubles, other doubles etc)

- 7) Order rain, ice, and snow from least dense to most dense. What are their respective densities?

snow (.5 g/mL) → ice (.92 g/mL) → rain (1 g/mL)

- 8) Suppose that you melt 80 mL of ice. What is the volume of liquid water that results?

$$d_{\text{ice}} = .92 \text{ g/mL}$$

mass of ice melting:

$$m = d \times V$$

$$= .92 \text{ g/mL} \times 80 \text{ mL} = \boxed{73.6 \text{ g}}$$

73.6 g liquid

water = 73.6 mL

- 9) Suppose that have a box with a volume of 22.5 mL. If you fill this box with ice, what mass of ice do you have?

$$m = d \times V$$

$$0.92 \frac{\text{g}}{\text{mL}} \times 22.5 \text{ mL} = \boxed{20.7 \text{ g}}$$

- 10) What kind of clothing should one wear when the temperature is 20°C . Explain.

$$^{\circ}\text{F} = (^{\circ}\text{C} \times \frac{9}{5}) + 32$$

$$^{\circ}\text{F} = (20^{\circ}\text{C} \times \frac{9}{5}) + 32 =$$

68°F Warm Weather

- 11) What is the difference between a boiling point and a melting point? What are these values for water?
- Boiling point: temp. of boiling and condensing (100°C , 212°F)
- Melting point: temp. of melting and freezing (0°C , 32°F)

- 12) What is "absolute zero"?

Hypothesized lowest possible temperature
 0 K or -273°C

- 13) Define temperature.

average kinetic energy

- 14) According to the kinetic theory of gases, describe how particles in a sample of gas move.

constant, random, straight-line motion; some particles move faster than others; collide with each other and container

- 15) Which gas variables does Charles's Law explain? What is the relationship between these variables?

T (Kelvin) and V

Direct Relationship

"Charles watches Direct TV"

- 16) A. 4.5 L gas sample at 20°C must be cooled to what temperature for the volume to change to 1.0 L?

$$\begin{array}{l} V_1 = 4.5\text{ L} \\ T_1 = 20^{\circ}\text{C} \end{array} \quad \begin{array}{l} V_2 = 1.0\text{ L} \\ T_2 = ? \end{array}$$

$$\frac{4.5\text{ L}}{293\text{ K}} = \frac{1.0\text{ L}}{T_2}$$

$$T_2 = 65.1\text{ K}$$

($V \downarrow$, $T \downarrow$)

- 17) A man heats a balloon in the oven. If the balloon initially has a volume of 0.6 liters and a temperature of 25°C , what will the volume of the balloon be after he heats it to a temperature of 225°C ?

$$\begin{array}{l} V_1 = 0.6\text{ L} \\ T_1 = 25^{\circ}\text{C} \end{array} \quad \begin{array}{l} V_2 = ? \\ T_2 = 225^{\circ}\text{C} \end{array}$$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{0.6\text{ L}}{298\text{ K}} = \frac{V_2}{498\text{ K}}$$

$$V_2 = 1.00\text{ L}$$

- 18) A soda bottle is flexible enough that the volume of the bottle can change even without opening it. If you have an empty soda bottle (volume of 2 L) at room temperature (25°C), what will the new volume be if you put it in your freezer (-4°C)?

$$\begin{array}{l} V_1 = 2\text{ L} \\ T_1 = 25^{\circ}\text{C} \end{array} \quad \begin{array}{l} V_2 = ? \\ T_2 = -4^{\circ}\text{C} \end{array}$$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{2\text{ L}}{298\text{ K}} = \frac{V_2}{269\text{ K}}$$

$$V_2 = 1.81\text{ L}$$

- 19) When does a cold front occur? How is it related to density?

-When cold air overtakes warm air

-Warm air pushed up (less dense) as advancing cold air moves underneath it (more dense)

- 20) A warm front is approaching your hometown and is due to arrive tomorrow. What kind of weather would you expect to observe? Which symbol on a weather map would show the front?

Warmer weather.



Unit 3, Section II

- 21) Describe sublimation. What type of change is this?

Phase change from solid to gas. Physical change.

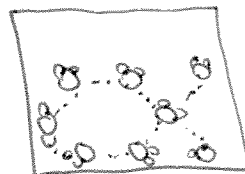
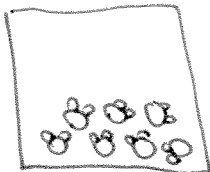
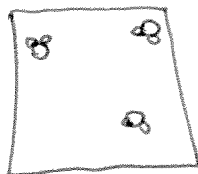
- 22) List the densities of gases, solids, and liquids from most dense to least dense.

Solid > liquid > gas

- 23) When water freezes, the water molecules move apart very slightly. What evidence can you provide to support this claim?

Solid water (ice) is less dense than liquid water.
Mass is spread out over larger volume → lower density

- 24) Draw a molecular view for water vapor, liquid water, and ice.



- 25) What is the volume of 10.0 g $\text{CO}_2(s)$? (The density is 1.56 g/mL)

$$d = \frac{m}{V}$$

$$V = \frac{m}{d} = \frac{10g}{1.56 \text{ g/mL}} = 6.4 \text{ mL}$$

- 26) Explain what causes air pressure.

Collisions of gas particles

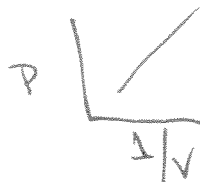
- 27) Which gas variables does Boyle's Law explain? What is the relationship between these variables?

V and P ; Inverse, indirect relationship

"Boyle is a VIP"

- 28) Sketch a graph of P vs. V. Then sketch a graph of P vs. $1/V$.

* More V, less collisions



- 29) If 1.00 L of a gas at standard temperature and pressure is compressed to 473 mL. What is the new pressure of the gas?

0°C

1 atm

* $V \downarrow, P \uparrow$

$$V_1 = 1.00 \text{ L}$$

$$V_2 = 473 \text{ mL}$$

$$T_1 = 0^\circ\text{C}$$

$$P_1 = 1 \text{ atm}$$

$$P_2 = ?$$

3

$$V_1 P_1 = V_2 P_2$$

$$(1.00 \text{ L})(1 \text{ atm}) = (0.473 \text{ L}) P_2$$

$$P_2 = 2.1 \text{ atm}$$

- 30) Synthetic diamonds can be manufactured at pressures of 6.00×10^4 atm. If we took 2.00 liters of gas at 1.00 atm and compressed it to a pressure of 6.00×10^4 atm, what would the volume of that gas be?

$$P_1 = 1.00 \text{ atm}$$

$$V_1 = 2.00 \text{ L}$$

$$P_2 = 6.00 \times 10^4 \text{ atm}$$

$$V_2 = ?$$

$$P_1 V_1 = P_2 V_2$$

$$(1 \text{ atm})(2 \text{ L}) = (6.00 \times 10^4 \text{ atm}) V_2$$

$$V_2 = 3.33 \times 10^{-5} \text{ L}$$

- 31) Which gas variables does Gay-Lussac's Law explain? What is the relationship between these variables?

T and P; Direct - higher T, move faster, collide more

- 32) A scuba-diving tank holds 21 L of air at a pressure of 38 atm. If the temperature does not change, what volume would this same air occupy if it were allowed to expand until it reached a pressure of 1.0 atm?

$$V_1 = 21 \text{ L}$$

$$V_2 = ?$$

$$P_1 = 38 \text{ atm}$$

$$P_2 = 1 \text{ atm}$$

$$P_1 V_1 = P_2 V_2$$

$$(38 \text{ atm})(21 \text{ L}) = (1 \text{ atm})(V_2)$$

$$V_2 = 798 \text{ L}$$

~~Pressure~~ P ↓, V ↑

- 33) Use the kinetic theory of gases to explain why decreasing the gas temperature decreases the gas pressure.

Lower T: particles have less kinetic energy and move more slowly. Then they collide less.

- 34) Which gas variables are part of the Combined Gas Law? Which gas laws does this law combine mathematically?

P, V, and T: Charles, Boyle's, Gay-Lussac's

- 35) If I initially have a gas at a pressure of 12 atm, a volume of 23 liters, and a temperature of 200 K, and then I raise the pressure to 14 atm and increase the temperature to 300 K, what is the new volume of the gas?

$$P_1 = 12 \text{ atm}$$

$$P_2 = 14 \text{ atm}$$

$$V_1 = 23 \text{ L}$$

$$V_2 = ?$$

$$T_1 = 200 \text{ K}$$

$$T_2 = 300 \text{ K}$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$V_2 = \frac{(12 \text{ atm})(23 \text{ L})(300 \text{ K})}{(14 \text{ atm})(200 \text{ K})}$$

$$V_2 = \frac{P_1 V_1 T_2}{P_2 T_1} =$$

$$V_2 = 29.6 \text{ L}$$

- 36) A gas that has a volume of 28 liters, a temperature of 45°C , and an unknown pressure has its volume increased to 34 liters and its temperature decreased to 35°C . If I measure the pressure after the change to be 2.0 atm, what was the original pressure of the gas?

$$V_1 = 28 \text{ L}$$

$$V_2 = 34 \text{ L}$$

$$T_1 = 45^\circ\text{C}$$

$$T_2 = 35^\circ\text{C}$$

$$P_2 = 2 \text{ atm}$$

$$P_1 = ?$$

$$P_1 = \frac{P_2 V_1 T_1}{V_2 T_2} = \frac{(2 \text{ atm})(34 \text{ L})(318 \text{ K})}{(28 \text{ L})(308 \text{ K})} =$$

$$= 2.5 \text{ atm}$$

- 37) How are areas of high and low pressure related to the weather?

High P: good, clear, sunny weather

Low P: bad, stormy weather

38) If the pressure of a gas is 82 psi, what is this pressure in atm?

$$\frac{82 \text{ psi}}{x} = \frac{14.7 \text{ psi}}{1 \text{ atm}} ; x = 5.6 \text{ atm} \quad // \quad 82 \text{ psi} \times \frac{1 \text{ atm}}{14.7 \text{ psi}} = 5.6 \text{ atm}$$

39) Convert a pressure of 985 torr to psi.

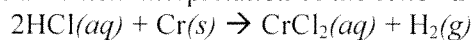
$$\frac{x}{985 \text{ torr}} = \frac{14.7 \text{ psi}}{760 \text{ torr}} ; x = 19.1 \text{ psi} \quad || \quad 985 \text{ torr} \times \frac{14.7 \text{ psi}}{760 \text{ torr}} =$$

40) Which gas law contains variables that are inversely proportional? What does this mean?

Boyle's Law ($V \propto \frac{1}{P}$): If one variable changes, the other does inversely; ex V doubles P divided in half

Unit 4, Section I

41) a) Write a written interpretation of the following chemical equation:



~~Fe~~ ~~metal~~ ~~is~~ aqueous hydrochloric acid and solid chromium react to form aqueous chromium(II) chloride and hydrogen gas

b. What are the reactants and products? What do the symbols in parentheses mean? What is the difference between a subscript and a coefficient?

- Reactants: HCl & Cr
- Products: CrCl_2 & H_2

- parentheses show states of matter
- subscript: # atoms
- coefficient: # molecules or moles

42) Toxic substances may be molecular, ionic, or metallic. Categorize the following compounds as ionic, molecular, or metallic:

a. CH_4O

b. Al

c. $\text{Ca}(\text{OH})_2$

d, Sn

e. CaO

molecular

metallic

ionic

metallic

ionic

43) Describe at least three types of effects that a toxic substance can have on the body.

irritate tissue, upset acidity of blood, clog filtering systems, etc.

44) Write a chemical equation showing sodium chloride melting.



45) Write a balanced chemical equation for these reaction descriptions:

a. Solid sodium chloride dissolves in water.



b. Solid calcium sulfide is heated to produce solid calcium and sulfur gas.



c. Solid sodium and chlorine gas yield solid sodium chloride.



46) The diatomic elements are:



47) What is the difference between a physical change and a chemical change?

Chemical change results in a new chemical substance(s)

48) Classify the following as physical or chemical changes:

- | | |
|-----------------------------------|---------------------------------|
| a. Water freezes. P | d. Iron rusts. C |
| b. Methane burns. C | e. Carbon dioxide sublimates. P |
| c. Calcium chloride decomposes. C | f. A paper is folded. P |

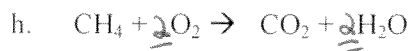
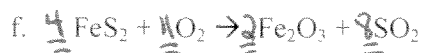
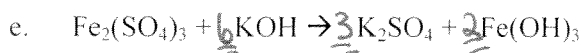
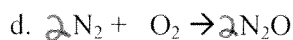
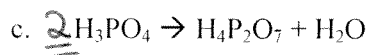
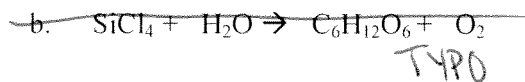
49) Classify the following as physical or chemical changes:

- a. $NH_4Cl(g) \rightarrow NH_4Cl(aq)$ P
- b. $2CH_3OH(l) + O_2(g) \rightarrow 2CH_2O(l) + 2H_2O(l)$ C
- c. $Hg(l) \rightarrow Hg(g)$ P
- d. $CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(s)$ C

50) Explain the law of conservation of mass.

Matter cannot be created nor destroyed

51) Balance the following chemical equations:



52) Write and balance the following chemical equations:

a. Potassium oxide + water \rightarrow potassium hydroxide



b. aluminum oxide \rightarrow aluminum + oxygen



c. iron(III) chloride + ammonium hydroxide \rightarrow iron(III) hydroxide + ammonium chloride



d. aluminum + hydrogen chloride \rightarrow aluminum chloride + hydrogen



53) Classify the type of reaction for the equations in #52.

b) Decomposition

c) Double exchange

a) Combination

d) Single exchange

Unit 4, Section II

54) What does "LD₅₀ is 500 mg/kg" mean?

The lethal dose for every kg a person weighs is 500 mg.

55) a) The LD₅₀ for Vitamin A is 1510 mg/kg. How many mg would be lethal to a 150-lb adult?

$$150 \text{ lb} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} \times \frac{1510 \text{ mg}}{\text{kg}} = 102,954.54 \text{ mg}$$

b) How many tablets containing 0.50 mg of Vitamin A would be lethal to this adult?

$$102,954.54 \text{ mg} \times \frac{\text{tablet}}{0.50 \text{ mg}} = 205,909.08 \text{ tablets}$$

56) How many 2-mg arsenic tablets would be lethal to a 200-lb adult if the LD₅₀ for arsenic is 15 mg/kg?

$$200 \text{ lb} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} \times \frac{15 \text{ mg}}{\text{kg}} \times \frac{\text{tablet}}{2 \text{ mg}} = 681.82 \text{ tablets}$$

57) What is "counting by weighing" and when is it useful?

Taking mass of a single object (or small # of them) and using it to determine # of large amount of small objects

$$\text{Count} = \frac{\text{mass all objects}}{\text{mass 1 object}} \quad 7$$

- 58) A lentil has a mass of 0.056 g. A sample of lentils is measured to have a total mass of 400 g. How many lentils are in the sample?

$$400 \text{ g} \div 0.056 \text{ g} = 7,142.9 \text{ lentils}$$

- 59) A lentil is measured on a balance to have a mass of 0.054 g. What is the % error in this measurement?

$$\% \text{ error} = \left| \frac{0.054 \text{ g} - 0.050 \text{ g}}{0.050 \text{ g}} \right| \times 100 = 3.57 \%$$

- 60) What is a mole?

counting unit (like a dozen); A mole contains 6.02×10^{23} objects

- 61) Define molar mass.

Mass of one mole of a substance
(listed on periodic table)

- 62) Two conversion factors relating to moles are:

$$1 \text{ mol} = 6.02 \times 10^{23} \text{ objects}$$

$$1 \text{ mol} = \# \text{ g (molar mass)}$$

- 63) What is the molar mass of:

a. Ir

$$192.22 \text{ g/mol}$$

b. Mn

$$54.94 \text{ g/mol}$$

c. Cu_2O

$$\begin{array}{r} 63.55 \times 2 \\ + 16.00 \\ \hline 143.10 \text{ g/mol} \end{array}$$

d. $(\text{NH}_4)_3\text{PO}_4$

$$\begin{array}{r} 14.01 \times 3 \\ 1.01 \times 12 \\ 30.97 \\ + 16.00 \times 4 \\ \hline 149.12 \text{ g/mol} \end{array}$$

- 64) a) I have 400 g of iridium. How many moles is this?

$$400 \text{ g Ir} \times \frac{1 \text{ mol}}{192.22 \text{ g}} = 2.08 \text{ mol}$$

- b) How many atoms of Ir do I have?

$$2.08 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = 1.25 \times 10^{24} \text{ atoms}$$

- 65) How many grams are in 2.65 moles of Cu_2O ?

$$2.65 \text{ mol} \times \frac{143.10 \text{ g}}{1 \text{ mol}} = 379.22 \text{ g}$$

- 66) A glass holds 50 g of H_2O . How many molecules are in the glass?

$$50 \text{ g} \times \frac{1 \text{ mol}}{18.02 \text{ g}} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 1.67 \times 10^{24} \text{ molecules}$$

- 67) Which is more toxic: 1 mol of Hg or 10 g of Hg? Explain.

$$1 \text{ mol Hg} \times \frac{200.59 \text{ g}}{1 \text{ mol}} = 200.59 \text{ g}$$

One mole is 200.59 g so this is more toxic than 10 g

- 68) Which has more mass: 5 moles of Cu_2O or 10 moles of CuO ?

$$5 \text{ mol} \times \frac{143.10 \text{ g}}{1 \text{ mol}} = 715.50 \text{ g Cu}_2\text{O}$$

$$* 10 \text{ mol CuO} \times \frac{79.55 \text{ g}}{1 \text{ mol}} = 795.50 \text{ g CuO}$$